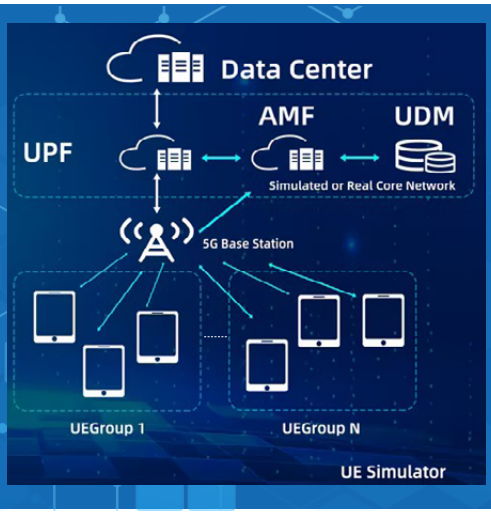
XWU series Multi-UE Simulator



XWU-S100/200 Multi-UE Simulator

The XWU-S100/200 is a high-capacity 5G terminal testing solution designed to support various test scenarios in 5G radio access networks. It enables functional, capacity, stress, and security testing of 5G base stations and core networks by simulating the access of tens of thousands of terminals across multiple cells. The system supports the emulation of mobile internet voice and data services, as well as various mobility models. With flexible configuration options for networking, specifications, and user service behavior, it provides unique, cost-effective solutions tailored to different service requirements.

Product Highlights

Comprehensive Scenarios

TheXWU-S100/200 can be applied to the R&D and testing of 5G network equipment, covering high-capacity performance evaluation, fundamental protocol functionality, and product security testing. The primary application scenarios include large-scale system performance testing for gNB and 5GC, protocol conformance and system function testing, domain-specific requirement validation, operator bidding processes, exhibition and demonstration testing, certification testing, and product security assessment. Specific test scenarios include:

- 5G SA FR1 testing
- FR2, NRDC, and NRCA testing
- U6G test
- Multi-UE protocol function testing
- Multi-UE capacity performance testing
- Multi-cell testing
- Caps impact testing,
- Multi-type business testing,
- Business stress testing
- Macro site and small site testing
- Security testing
- Interoperability and conformance testing
- MIMO testing
- 5G private network testing

Extensive Functionality

The XWU-S100/200 provides terminal capabilities that comply with 5G standard protocols, the ability to simulate real network user behavior, and continuous evolution towards future protocols such as 5G-A. Additionally, XWU-S100/200 supports customized feature development based on customer requirements and offers customized testing solutions.

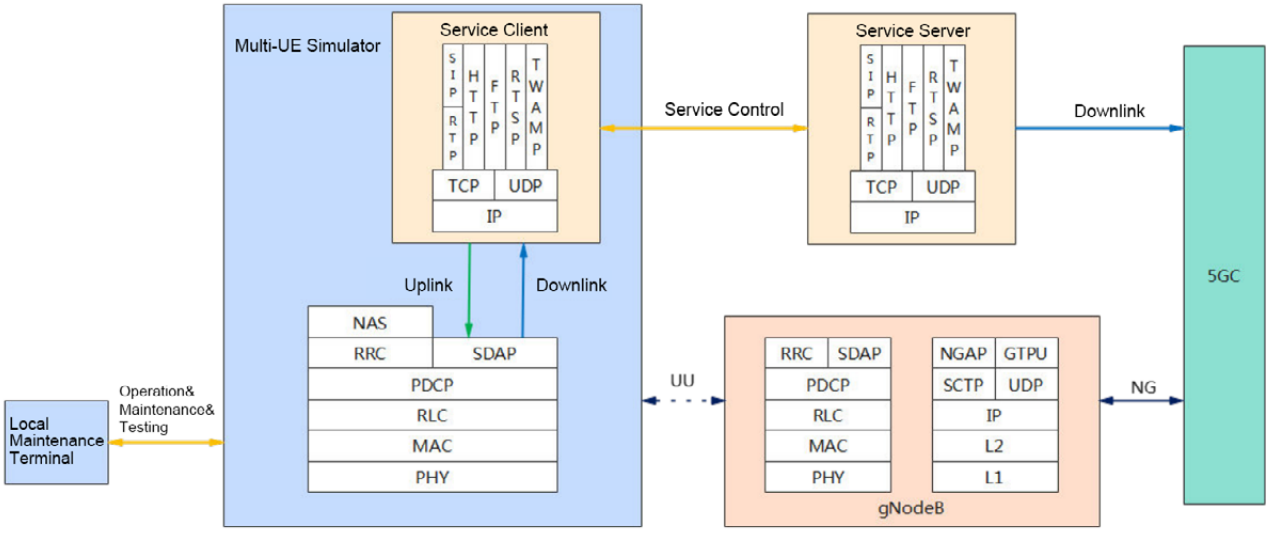
- Supports 3GPP R15/R16/R17 protocol stack (NAS/RRC/SDAP/PDCP/RLC/MAC/PHY);
- Supports Internet Protocol SIP/RTP/RTSP/FTP/HTTP/TCP/UDP/IP/ICMP;
- Supports wireless features such as UE near, mid, and far point distribution, extended coverage, and channel fast fading;
- Support complex application scenarios such as super cells, RedCap, carrier aggregation, etc;
- Support physical layer features and functions (DSS, NI scrambling, DMRS interpolation, FDMON, MU-MIMO, etc.);
- Supports security testing functions for NAS/RRC/PDCP protocols and DDOS (Distributed Denial of Service) attack testing;

Efficient operation and maintenance

The XWU-S100/200 offers flexible configuration options that are compatible with both visual and scripted approaches, providing rich maintenance and measurement data along with powerful analytical capabilities，which accelerates test result evaluation and issue troubleshooting. The R&D and support teams can efficiently support and quickly respond to testing requirements, offering various technical services.

- Fully graphical user interface(GUI)
- Multi-dimensional data management
- Flexible control of user distribution and business behavior
- Hierarchical dimensional measurement data
- System operation status monitoring and diagnostics
- Rich statistical data logs
- Automation and API interface
- Comprehensive user guides

Specifications



Classification	Items	Function
Protocol stack	NAS	Mobility management, session management, security, network slicing;
	RRC	SIB, paging, RRC connection, configuration and maintenance of SRB and DRB, reconnection, Inactive, security, mobility, measurement, etc;
	SDAP	Mapping from QosFlow to DRB and QoS reflection;
	PDCP	Header compression, encryption, and integrity protection; data discarding; data replication; data recovery; reordering and sequential delivery, out-of-order delivery;
	RLC	TM\UM\AM transmission modes, ARQ error correction, slicing, re-slicing and reassembly, duplicate packet detection, data discarding, RLC reestablishment;
	MAC	Mapping of logical channels and transport channels; multiplexing or demultiplexing of MAC SDUs belonging to one or multiple logical channels into transport blocks (TBs); delivery of TBs to the physical layer through transport channels; HARQ error correction; uplink scheduling (dynamic scheduling, pre-scheduling, configured grant scheduling); priority scheduling of different logical channels;
Baseband	PUSCH/ PDSCH	Bit-level processing; rate matching; scrambling; modulation & demodulation; layer mapping;
	PUCCH	UCI feedback (HARQ/CSI/SR);
	PRACH	Competitive and non-competitive access; maintain Preamble, RA occasional;
	PDCCH	DCI blind detection completes scheduling control for PUSCH and PDSCH;
	SSB	Acquire the cell PCI and establish downlink timing through the primary synchronization signal (PSS) and secondary synchronization signal (SSS), and handle the MIB process;
Platform Process		Linux system; link management;
RFU		Baseband time-domain data and air interface RF signal conversion
Business Tools	ServiceMgr	IP/UDP/TCP/HTTP/FTP/RTSP/TWAMP/SIP/RTP data management;
Operation, maintenance, and testing	LMT	Configuration, KPI, signaling, alarm, status, report, log, automated management;

Functions

Category	Function	Description
Protocol	mo-signalling	Multiple UE initiation of RRC connection establishment, MM registration, SM establishment, and MM deregistration processes based on access intervals, connection hold duration, and idle duration; supports RRC connection re-establishment process.
	mo-data	Multiple UEs transition to Idle/Inactive without active service, and trigger the transition out of Idle/Inactive upon uplink service activity.
	mt-access	Downlink service paging triggers the transition out of Idle/Inactive state.
	rna-Update	Inter-cell transition out of Inactive state
	Security	Supports NAS/RRC/PDCP layer encryption and integrity protection based on SNOW 3G/ AES/ZUC algorithms.
	ROHC	IP/UDP/RTP
Business type	FTP	Direction (UL/DL/BI), file size, file path, and send/receive window are configurable.
	HTTP	Request type (POST/GET), access count, access interval, file size and path, send and receive window can be configured
	IPERF	Protocol type (UDP/TCP), direction (UL/DL/BI), packet length, packet interval, packet quantity, bandwidth configurable
	PING	The number of pings, ping packet size, ping packet interval, and ping direction are configurable
	VONR/VINR	Silence ratio, voice codec type, video codec type, video resolution are configurable, along with VONR long call and short call.
	TWAMP	The direction (UL/DL), packet length, packet interval, and packet quantity are configurable
	RTSP	Request type, voice bitrate, and video bitrate are configurable.
Wireless	Large-scale simulation	Support fixed-point grouping tests for downlink extreme close points, close points, midpoints, and far points
		Support fixed-point grouping tests for uplink very near points, near points, midpoints, and far points
		Support downlink mobility near, mid, and far range expansion coverage testing
		Support uplink mobility near, mid, and far range expansion coverage testing
	Small-scale simulation	Support downlink small-scale fast fading channel packet testing
		Support uplink small-scale fast fading channel packet testing
	Multi-cell RRC handover	By configuring UE groups in multi-cell inter-zone movement mode, movement points, movement speeds, and switching CAPS, simulate the implementation of event-based intra-frequency and inter-frequency handover for UE groups across multiple cells
	Uplink closed-loop power control	As the UE moves within the cell at near, mid, and far points, the power of PUSCH/PUCCH/ SRS channels varies according to path loss, and the power gain is adjusted in response to the base station's FI/GI/HI adjustments
Operation, maintenance, and maintenance testing	Group control	Support cross-configuration of user near, mid, and far locations with business types
	Service control	Support the control of start and stop of different business types (FTP/HTTP/IPER/VONR) based on business delay, duration, and repetitive behavior
	Service concurrency	Support parallel operation of different services (FTP/HTTP/IPER/VONR) for each UE
	Traffic model testing	Support configuring peak and off-peak traffic models through Sequence
	Fine-grained UE capability configuration	Support cross-configuration of UE capabilities with near, mid, and far locations, as well as service types
	Configuration set management	Support configuration set replication/modification/import/export/backup
	KPI	Support real-time and historical KPI observation, as well as full and customized queries, at the cell level, mobile group level, service group level, and UE level for RRC/NAS/PDCP/ RLC/MAC/PHY
	Signaling trace	Support real-time signaling observation and historical signaling query
	Alarm	Supports real-time alarm reporting and historical alarm query at both physical and logical levels, categorized as critical/major/minor
	State	Support the reporting of physical network element status, links, MIB/SIB1/cell status, RRC, and NAS status
	Report	Support automatic export of real-time and historical KPI calculation data throughout the entire business execution process, for measuring the health of business execution
	Reoccurrence-free log	Support log record saving, querying, and analysis functions
	Automation	Provide a rich set of automated API interfaces for flexible control of various model business operations, and automatically report execution processes and results, as well as statistical measurement data

Key Features

Category	Function	Description
Protocol	5G Lightweight (RedCap)	1.Supports RedCap UE and eMBB UE sharing the initial BWP and dedicated BWP. 2.Supports RedCap UE and eMBB UE sharing the initial BWP with independent dedicated BWP. 3.Supports RedCap UE and eMBB UE with independent initial BWP, sharing dedicated BWP. 4.Supports RedCap UE and eMBB UE with independent initial BWP and independent dedicated BWP. 5.Supports initial BWP and dedicated BWP including NCD-SSB.
	Super cell	1.Supports multi-CP activation and CP mobility in super cells. 2.Supports SDMA (Spatial Division Multiple Access). 3.Supports CP mobility between super cells and regular cells.
	MU-MIMO	Supports 4/8/16/24-layer MIMO
	DSS	1.Supports FDD full bandwidth dynamic spectrum sharing. 2.Supports FDD partial bandwidth dynamic spectrum sharing.
	PUSCH channel noise scrambling	Supports adding interference signals to PUSCH channel grouping, enabling CINR variation scenario testing requirements.
	PDSCH channel noise scrambling	Supports PDSCH channel grouping scrambling to achieve CINR variation scenario testing requirements.
	BWP switching	1. Supports RRC BWP switching. 2. Supports DCI BWP switching.
	DMRS insertion/interleaving	Supports PDSCH DMRS and PDSCH multiplexing, enabling PDSCH peak enhancement.
	Downlink FDMON	Supports PDCCH and PDSCH multiplexing functionality, enabling PDSCH peak enhancement.
Security	Distributed Denial of Service Attack (DDoS)	1.Supports RRC connection resource exhaustion attacks. 2.Supports wireless resource hijacking, causing DoS attacks. 3.Supports flood attacks by abnormal terminals targeting the air interface. 4.Supports malicious terminals sending a large volume of signaling data attacks after accessing the network. 5.Supports attacks by users who successfully access the gNodeB and send malformed messages at various protocol layers in the uplink.